AMATEUR SATELLITE REPORT

Number 179
July 18, 1988

Editor: Vern Riportella, WA2LQQ
Managing Editor: Bob Myers, W1XT

AMSAT® NA *Newsletter for the Amateur Radio Space Program*

Amateur Satellite Report is endorsed by the American Radio Relay League as the special interest Newsletter serving the Amateur Radio Satellite Community

Copyright 1988 by AMSAT® NA, The Radio Amateur Satellite Corporation. AMSAT® is a registered trademark.

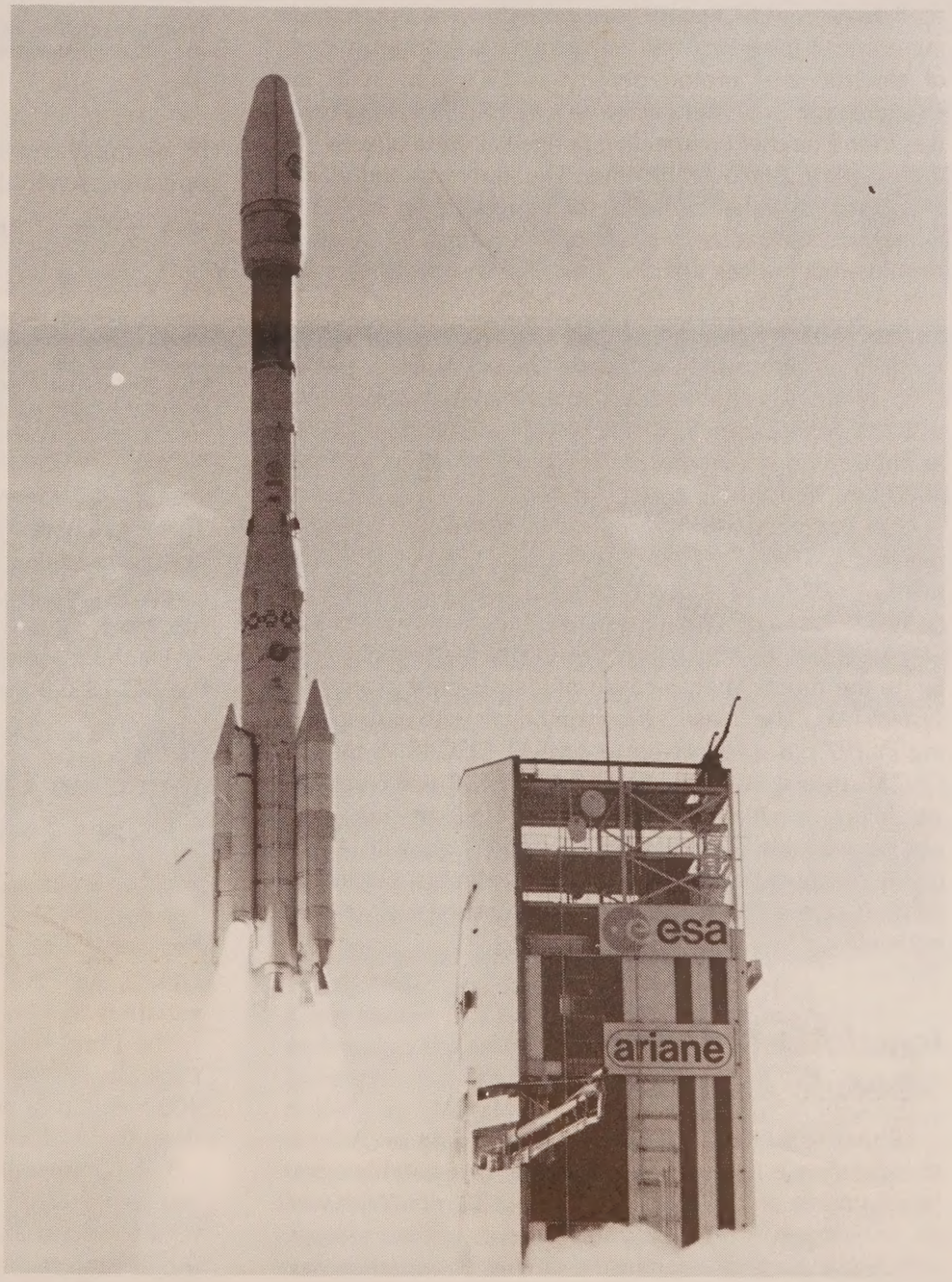
AO-13 Achieves Decade-Old Objective In Reaching Molniya Orbit

In the third and final segment of a flawless trek from jungle launch pad to its orbital residence for the next millennium or so, AMSAT OSCAR 13 has fulfilled a decade-old plan that two prior efforts failed to achieve. It's become history's first OSCAR in a Molniya-type orbit. This momentous event was culminated in a dramatic "go-for-broke" in-orbit maneuver consisting of a 5.5 minute burn of AO-13's kick motor. Early indications are that the burn was perfection itself yielding close to the best expectation for orbital plane change and apogee target.

The first step to orbit was a flawless launch to GTO (geosynchronous transfer orbit) by the new Ariane-4 launcher of the European Space Agency June 15. All three satellites launched by Ariane mission V-22 have now successfully attained their final orbits. The GTO provided by Ariane mission V-22 had a 36,000 km apogee, 220 km perigee and an inclination of just under 10 degrees.

The second step for AMSAT OSCAR 13 was taken a week after launch when, on June 22, the kick motor was ignited for the first time. The result was an intermediate orbit with perigee at 1081 km and inclination raised to 14.3 degrees. Apogee remained very nearly unchanged.

Beginning immediately after the first burn, re-orientation and spin up proceeded. By Saturday, July 2, AO-13 had attained the desired second burn attitude (-59 degrees longitude; -70 degrees latitude in the



The launch, a few seconds after lift off.

Bahn coordinate system). By Wednesday, July 6, the spin rate reached the desired 60 rpm.

Getting the spin rate up to 60 rpm took considerable time due to the attitude of AO-13 with respect to the geomagnetic field. Spinning up to the relatively high rate of 60 rpm is done for at least two reasons. First, the gyroscopic effect of the spin stabilizes the spacecraft during motor firing. Second, the fuel in the tanks will be forced towards the exit ports by the centrifugal force imposed on it by the spinning. This will insure most, if not all, of the fuel is expelled into combustion chamber. Once in its final orbit, AO-13 becomes easier to despin and re-orient due to the orientation of the orbital plane with respect to the geomagnetic field.

The stage was thus set for the third and climactic step. It had been decided to raise the target perigee a bit to about 2200 km to add some margin for error and to increase subsequent Southern Hemisphere coverage. The increased margin for error was desired since even a relatively minor "propulsion system hiccup" at the wrong moment could spell disaster. AO-13 could have gone down as a man-made meteorite if the worst had happened. A short-term study of electron and proton density at 1500 and 3000 km altitudes had been performed by the AMSAT DL team. It was found neither prospective perigee altitude offered any distinct advantage over the other. The study was undertaken to ascertain whether changing the perigee target for AO-13 would affect its radiation environment and thus its lifetime. With neither perigee altitude showing a distinct advantage, it was decided to raise the target perigee altitude from its former 1500 km to a new target of 2000 to 2500 km.

The 5.5 minute rocket engine "burn" began at 21:05 UTC, July 6. The burn added about 1 mile per second to AO-13's orbital velocity. The plane of the orbit was raised to about 58 degrees and the perigee was raised to about 2500 km. In a word, it was "perfect".

AO-13 reached its near-Molniya orbit where two prior attempts have failed. Phase 3A was lost in 1980 when Ariane mission L-02 failed and was destroyed. In 1983, Phase 3B (which became AO-10) made it to GTO aboard Ariane L-06 and achieved an initial motor burn but was unable to reignite the motor later because of a suspected propulsion system leak. The Phase 3 Program began with early planning in 1976 as a follow-on to AMSAT OSCAR 7, the first OSCAR to use Mode B. AMSAT OSCAR 8 was built as a gap-filler when it appeared the first Phase 3 satellite would not be available until after AO-7 died. Thus, with AO-13 finally reaching the Phase 3 objective orbit first outlined in 1976, it caps a 12 year-plus program costing well over $1 million.

Initial AO-13 Operating Schedule Announced

All that remains to be done before turning on AO-13's transponders is to re-orient the satellite to a suitable operational attitude and spin it down to about 30 rpm. With work on bringing AO-13 to full operational readiness going so well, initial plans for opening the satellite to operation have been announced. If all continues to go well, AO-13 could be on the air by July 20. Here is the preliminary AO-13 operating schedule.

Doug Loughmiller, KO5I, V.P of Field Operations presents outstanding Area Coordinator Award to Al Brinckerhoff, WB5PMR.

Mode	From	Thru	Duration MA	Minutes
Off	MA 225	MA 29	61	163.7
Mode B	MA 30	MA 97	68	182.5
Mode L	MA 98	MA 157 (daily)	60	161.0
Mode JL	MA 98	MA 157 (weekends only)	60	161.0
Mode B	MA 158	MA 224	67	179.8
Mode S	Mode-S operations will commence when sun angles permit; likely in September)			
RUDAK	Concurrent with Mode L			

Each MA (Mean Anomaly) unit equals 2.6834 minutes. This is calculated by taking the period of the orbit (686.96 minutes) and dividing it into 256 equal parts. The MA clock resets to zero at perigee. Half way through the orbit, the MA clock equals 128 at apogee.

Watch for possible changes to this schedule as posted on the AO-13 GB (145.812 MHz).

Precision Of Motor Burn Amazes Even The Experts

In the wake of the highly successful AO-13 kick motor burn, AMSAT leaders and members around the world were heaping praise on AMSAT-DL President Karl Meinzer, DJ4ZC, and Peter Guelzow, DB2OS, who fine-tuned all the variables to a state of near-perfection.

The propulsion subsystem components engineered by Dick Daniels, W4PUJ, similarly worked to perfection. The 400 Newton bi-propellant kick motor donated by MBB of West Germany did exactly as it was supposed to do as well.

The combination of outstanding efforts of the analysts, engineers, technicians and command stations has established the second and final AO-13 kick motor burn as one of the all-time technical high water marks in all of Amateur Radio's history. According to experts in the field, the degree

of precision with which AO-13 was taken from GTO through two kick motor burns would rate kudos in any league in the world; not just Amateur Radio.

The 5.5 minute motor burn July 6 was a "burn to depletion" exercise which apparently used virtually every bit of propellant available. Helium pressure dropped in the last minute or so of ignition and the burn continued unabated in "blow-down" mode. Even when the nitrogen tetroxide and Aerozine 50 were exhausted, the venting of the helium pressurization gas added to the total delta V. This may have added a tenth of a degree to the inclination said W3GEY.

On a somewhat lighter note, KA9Q calculated the output of the little rocket engine. He says: "Just the energy imparted to the kinetic energy of the exhaust represented a power of 600 kilowatts. The additional energy used to heat and ionize the exhaust probably brought the total power developed by the engine to well over a megawatt. Given that the command receiver works with signals on the order of -144 dBW, the spacecraft's "power gain" was over 200 dB. That probably makes it one of the highest gain devices ever built by hams! (Hi)."

KA9Q provided his best estimate of the orbit as follows:

Satellite:	Oscar 13
Catalog number:	19216
Epoch time:	88190.00000000
Fri Jul 8 00:00:00.0 1988 UTC	
Element set:	ka9q-5
Inclination:	58.9522 deg
RA of node:	247.7443 deg
Eccentricity:	0.6545803
Arg of perigee:	187.1127 deg
Mean anomaly:	293.2909 deg
Mean motion:	2.09619370 rev/day
Decay rate:	0 rev/day^2
Epoch rev:	49
Semi major axis:	25789.393 km
Anom period:	686.959416 min
Apogee:	36292.717 km
Perigee:	2530.260 km
Ref perigee:	3841.08839978
Fri Jul 8 02:07:17.740 1988 UTC	

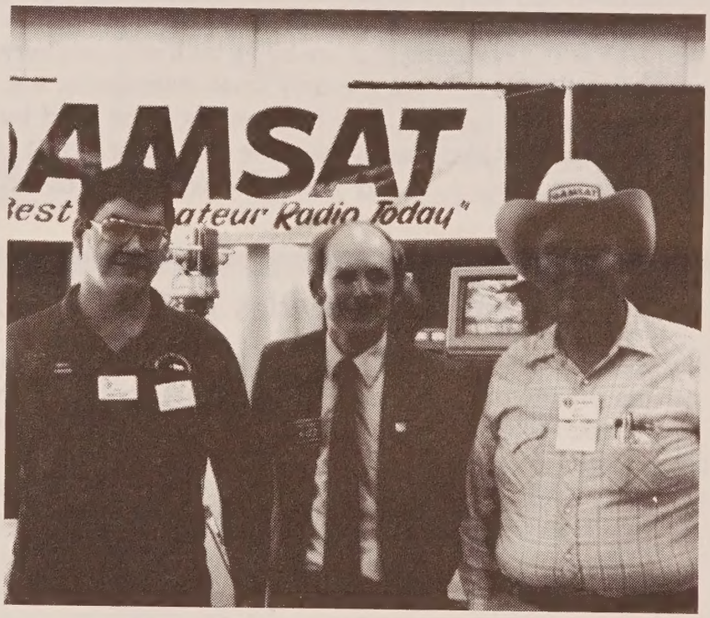
Jack Crabtree, AAØP, (left) presents Bill Hans with a copy of Bill's airbrush painting of AO-13. Bill's painting became AMSAT's new AO-13 poster.

Many Listen As Kick Motor Light-Up Is Described

A last minute telecommunication lash-up with participants on three continents provided listeners to a special 20 meter net a breathtaking account of AO-13's second kick motor firing July 6.

The key was AMSAT-DL's Hanspeter Kuhlen, DK1YQ, the RUDAK Project leader, who called off the key telemetry values being sent by AO-13 just before and during the critical motor burn. Hanspeter joined an international team linked by telephone consisting of himself in Munich, Hans Van De Groenendahl, ZS6AKV in Johannesburg, Junior DeCastro, PY2BJO in Sao Paulo, Jan King, W3GEY in Colorado and Phil Karn, KA9Q, in New Jersey. The special network used an rf link to listeners on 14.282 MHz via WA2LQQ. Listeners were logged in from 4 continents. Unfortunately for those in North America, however, the satellite was not then in view.

ZS6AKV, with help from ZS6BTD, monitored telemetry from AO-13 as did PY2BJO. But the key element was Hanspeter's translation of the "Q" blocks of telemetry. As



Keith Bergland, WB5ZDP, Dave Sumner, K1ZZ, and Keith Pugh, W5IU, at the Ham-com 88, June 3, 4, 5, 1988.

expected, 10 minutes prior to the burn, the Engineering Beacon was switched on. Then Hanspeter began calling various telemetry readings as the moment of truth approached. The tension mounted as he announced the Liquid Ignition Unit (LIU) had been powered up as programmed. Everything was armed. And time stood still for hundreds of listeners.

Just before 21:05 UTC, DK1YQ gave the word all were waiting for. The motor valves were open! Then things began to happen fast. The temperature on the -Z surface jumped quickly by 17 degrees as the nearby rocket engine nozzle climbed to nearly 1800 degrees Celsius. Was the infrared radiation charring off the special thermal coating on the -Z surface? How much hotter would it get? Anxious engineers waited for the next "Q" block. No more rise. The temperature stabilized.

For those only casually listening to AO-13, something

clearly was happening. There was a clear change in the signal's fading pattern. It was on its way!

Then, only 5.5 minutes later it was a done deed. With a collective sigh of relief, the hundreds witnessing the event on the 20 meter net looked to their computers to determine when they would first see AO-13 in its new orbit.

According to many who listened in on the special motor burn net, the sense of participating in an historic event was palpable. All were very complimentary of the running commentary of DK1YQ and the analysis of W3GEY and KA9Q. ZS6AKV and PY2BJO provided excellent back-up as well.

News On RS Satellites From PAØDLO

Richard Limebear, G3RWL, says there is interesting news about the RS satellites from PAØDLO and UA3CR. According to PAØDLO:

Today, (July 2), UA3CR reported in the European AMSAT Net that for the time being RS11 will be in operation. Mode A and the ROBOT will be ON all the time. Mode K, however, will be ON Tuesdays through Fridays. It will be OFF on Saturdays, Sundays and Mondays, according to the RS command station RS3A. There are no plans for Mode T operations at present. Leonid also reported that the new RS12/13 satellite systems, that are being built now, are very similar to RS10/11. There are only small differences, e.g. in the telemetry systems. The frequencies to be used by RS12/13 are most likely nearly the same as those of RS10/11, so the same mode A, K and T transponders are to be expected. The RS12/13 systems will also be built into another satellite. Launch is planned some time during the summer of 1989. A brand new RS satellite is also being developed now by the RS team, according to Leonid. This new satellite, probably RS14, will carry Mode B, Mode J and possibly other transponders, along with several other new features. This "state of the art" RS satellite should be ready for launch in about 3 years time.

Following the SKITREK progress in New Jersey was sixth grade teacher Dale Lacue, KB2CIL, and her students Jim Henry, Donna Marchetti, Doug Miller, Heather Brandel, and Kara Carpenter.

AO-13 Telemetry Provides Intimate Look At Inner Workings

Like a physician's stethoscope, AO-13's telemetry stream is a monitor of its heartbeat. To the careful listener, the telemetry stream on any of the beacons is an opportunity to see and understand deeply the condition of the spacecraft. In future, moreover, bulletins of interest and importance to the satellite user will be broadcast over the beacons. To those equipped to monitor the telemetry, AO-13 will be an open book.

AO-13 telemetry is transmitted in three forms: PSK (phase shift keyed); RTTY; CW. The RTTY uses FSK (frequency shift keyed) tones spaced 170 Hz at a signaling rate of 50 baud. RTTY telemetry is sent at 15 and 45 minutes past the hour. CW telemetry is sent at 10 wpm at 0 and 30 minutes past the hour. PSK telemetry is sent at other times at 400 baud. The Mode B General Beacon is at 145.812 MHz. Telemetry reception in many areas has been hampered by FM users many of whom are unaware 145.800 to 146.000 MHz is, by general agreement, a sanctuary for weak signal, satellite operations.

Telemetry indicated effects from the huge solar flare Saturday, June 25. By Sunday, those monitoring AO-13's PSK telemetry had already detected "hits" in the satellite's computer. Although no damage was expected and none occurred, the intense burst of radiation from the sun registered on AO-13 when its self-correcting devices were obliged to correct for radiation-induced errors in the IHU. These were seen as memory "soft errors" meaning a temporary upset caused by radiation had occurred. The AO-13 IHU and memory are extremely radiation resistant, a least a thousand times more than AO-10, and so the radiation hits are of academic interest but pose not real threat to its health. Watching the hits can, however, give an idea when solar radiation and particles arrive in the vicinity of earth.

50 baud RTTY data	Remarks
Z HI. THIS IS AMSAT OSCAR 13 01.47.27 3827	Time and date of frame. Day 3827 is 11Jul88
64 2 0 1 16 226 0	Miscellaneous binary values
	Telemetry channels in hex
245 7 147 132 192 7 138 48 200 126	Telemetry channels 00 thru 09
137 7 96 134 143 47 7 143 138 7	Telemetry channels 0A thru 13
14 99 136 56 7 7 135 7 116 7	Telemetry channels 14 thru 1D
137 7 206 136 134 7 69 131 138 35	Telemetry channels 1E thru 27
107 140 138 7 226 137 129 7 178 134	Telemetry channels 28 thru 31
122 7 111 133 137 137 15 122 129 206	Telemetry channels 32 thru 3C (Channel 3B is skipped)

Sixty four channels of telemetry are sent in PSK. The first 60 of these are sent in RTTY as well. Here is a sample frame of AO-13 telemetry as received on a RTTY system (PK-232) set for 50 baud.

This is a sample RTTY telemetry frame captured at 01:47:27 UTC, 11 July 88.

Plugging values obtained 01:47:27 UTC 11 Jul 88 Into Table from *ASR* #178

Value of "n"	Telemetry Channel (Hex Desig)	Function	Equation	Value Obtained	Units
245	00	Solar panel out and BCR input voltage	(n-10)*167	39245	mV
7	01	70 cm xmtr average power output	(261-n)²/724	0	W
147	02	70 cm rcvr temperature	(n-120)/1.71	15.8	C
132	03	(Reserved)		-	-
192	04	BCR output and main battery voltage	(n-10)*79.5	14469	mV
7	05	(Special Purpose)	xxxxxxxxx	-	-
138	06	2 m xmtr power amplifier temperature	(n-120)/1.71	10.5	C
48	07	+14 volt rail current to xponder	(n-15)*24.27	800.9	mA
200	08	+10 volt regulator voltage	(n-10)*53.2	10108	mV
126	09	Helium tank high pressure	(n-14)*6.56	734.7	Bar
137	0A	IHU temperature	(n-120)/1.71	9.9	C
7	0B	+14 volt rail current to magnetorquers and antenna relay	(n-15)*4.854	0	- mA
96	0C	BCR oscillator #1 status	0 = Off; N > 10 = On	On	-
134	0D	He tank low side pressure control volt	(n-15)*.117	13.923	Bar
143	0E	BCR temperature	(n-120)/1.71	13.4	C
47	0F	+10 volt regulator current	(n-15)*4.854	155.33	mA
7	10	BCR oscillator #2 status	0 = Off; N > 10 = On	Off	-
143	11	N2O2 tank pressure	(n-106)*0.733	27.12	Bar
138	12	SEU temperature	(n-120)/1.71	10.5	C
7	13	Battery charge current	(n-15)*12.135	0	mA
14	14	Top (+Z) photocell sun sensor	(n-10)*8.53	34.12	mV
99	15	Motor valve status	102 = Closed, 118 = Open	Closed	
136	16	Auxillary battery #1 temperature	(n-120)/1.71	9.4	C
56	17	Active BCR ouput current	(n-15)*24.27	995.07	mA
7	18	Bottom (-Z) photocell sensor	(n-10)*8.53	0	mA
7	19	XXXXXXXXXXX		0	-
135	1A	Auxillary battery #2 temperature	(n-120)/1.71	8.8	C
7	1B	Active BCR input current on 28 volt bus	(n-15)*12.135	0	mA
116	1C	Spin rate {if n<139,	r = (131-n)*0.85 + 20	32.75	rpm
		or {if n> = 139	r = 479/(n-109)-2		rpm
7	1D	L rcvr AGC	(n-75)²/-1125	0	dB
137	1E	Main battery temperature	(n-120)/1.71	9.9	C
7	1F	Solar panel #6 current	(n-15)*4.854	0	mA
206	20	2m xmtr average power output	(287-n)²/1796	3.653	W
136	21	He tank temperature	(n-120)/1.71	9.4	C
134	22	Solar panel #1 temperature	(n-120)/1.71	8.2	C
7	23	Solar panel #5 current	(n-15)*4.854	0	mA
69	24	70 cm rcvr AGC	(n-71)²/2465	0	dB
131	25	70 cm xmtr PA temperature	(n-120)/1.71	6.4	C
138	26	Solar panel #3 temperature	(n-120)/1.71	10.5	C
35	27	Solar panel #4 current	(n-15)*4.854	97.08	mA
107	28	Special purpose	xxxxxxxxx	-	-
140	29	24 cm rcvr temperature	(n-120)/1.71	11.7	C
138	2A	Solar panel #5 temperature	(n-120)/1.71	10.5	C
7	2B	Solar panel #3 current	(n-15)*4.854	0	mA
226	2C	+14 volt regulator voltage	(n-10)*66.8	14429	mV
137	2D	RUDAK temperature	(n-120)/1.71	9.9	C
129	2E	Top (+Z) skin temperature of arm #1	(n-120)/1.71	5.3	C
7	2F	Solar panel #2 current	(n-15)*4.854	0	mA
178	30	Mode B transponder +9 V supply voltage	(n-10)*54	9072	mV
134	31	Wall temperature in arm #2	(n-120)/1.71	8.2	C
122	32	Bottom (-Z) skin temperature of arm #1	(n-120)/1.71	1.2	C
7	33	Solar panel #1 current	(n-15)*4.854	0	mA
111	34	Special purpose	xxxxxxxxx	-	-
133	35	Wall temperature in arm #1	(n-120)/1.71	7.6	C
137	36	N2O4 tank temperature	(n-120)/1.71	9.9	C
137	37	Reserved		-	-
15	38	Auxillary battery voltage	(n-10)*78.5	392.5	mV
122	39	Mode S transponder temperature	(n-120)/1.71	1.2	C
129	3A	+Z platform temperature (SERI exp)	(n-120)/1.71	5.3	C
-	3B	Reserved		-	-
206	3C	Mode L transponder +9 V supply voltage	(n-10)*45.4	8898	mV
-	3D	AZ-50 tank temperature	(n-120)/1.71	-	C
-	3E	Nutation damper temperature	(n-120)/1.71	-	C
-	3F	Reserved		-	-

Channel 01 equation may be wrong; probably should be (261-n)²/1724.
Spin rate, channel 1C, is wrong. New software being developed.

[This article is dedicated to Ted Mathewson, W4FJ, with thanks for his generous donation on the occasion of AO-13's arrival in its final orbit. Ed.]

Transpolar Skitrek Expedition Report Number 20: June 11, 1988

The thirteen members of the Transpolar Skitrek Expedition have spent the past week in medical testing and debriefings after their 3 months on the arctic ice. One unexpected outcome of the expedition may be a medical confirmation of the recently discovered thinning of the ozone layer over the arctic. Increased solar radiation at ultraviolet wavelengths may be responsible for the very deep sunburns received by all skiers despite their use of sunblocking creams that only let in some 4 percent of the sun's harmful rays. This is the speculation of Canadian skier/doctor Matthew Buxton who cautioned reporters to remember that the thirteen never experienced night during most of the trek and therefore received long sun exposure albeit at a low sun angle.

Fifty or sixty Amateur Radio operators were behind the communications effort involved in the Transpolar Skitrek Expedition. We are indebted to a number of these for their support and involvement in our Skitrek education program. In Canada we are especially grateful to Tom Atkins, VE3CDM, CRRL President who provided basic information appearing in the guide and additional support throughout the expedition. John Henry, VE2VQ, a member of AMSAT's Board of Directors, provided the SARSAT-OSCAR 11 connection. Garth Hamilton, VE3HO, provided us directly with information from the trekkers following his stint at

Resolute Bay. At the University of Surrey's UoSAT Control Center, Michael Meerman, GØ/PA3BHF, programmed the Digitalker during the trek, put our progress reports on the UO-11 weekly 1200 baud bulletins, and represented us on his trip to the skiers at the North Pole. We are especially indebted to Ralph Wallio, WØRPK, AMSAT's VP for Operations who taped and transcribed the daily HF Nets from the far north and provided us with much of the information appearing in the progress reports. Ralph's bulletin board was the access route to information for many North American schools following the trek.

The Skitrek was followed by at least 100,000 students worldwide of all age levels. From New Zealand 5 year olds to University students in Sri Lanka, the trek was followed in a variety of modes and levels. All discovered satellites through the Digitalker and expanded their understanding of the far North. The questionnaires which are now being returned as well as letters from educators show a tremendous enthusiasm for this project and a hunger for more links between ham radio satellites and the classroom.

Looking back as an educator/ham over the last three months, it has been very gratifying to see growing connections being made between the Amateur Radio and education community. Educators are always looking for new and innovative approaches to their craft, especially when hands-on experiences related to concepts they teach are offered to students. AMSAT leadership believes that there is much more we can offer to the education community. To that end an international task force of education minded amateurs will shortly be formed to devise a plan leading to a wide ranging set of space education materials/activities to be used in future AMSAT classroom endeavors. If you are interested in being a member of that task force or just having input to it, please contact:

Richard C. Ensign, N8IWJ
AMSAT Science Education Advisor
421 N. Military, Dearborn, MI 48124, U.S.A.

Finally, thanks to the hundreds of hams around the world who took their hobby to the schools and shared this marvelous adventure with students. You can look for more sharing opportunities in the near future as AMSAT uses its resources to develop classroom space education materials. (By Rich Ensign, N8IWJ; AMSAT Science Education Advisor)

Perspectives On CSG Kourou By A Few Recent Tenants

A Backgrounder by Ed O'Grady, KC2ZF

Trois-Deux-Un-Feu! With these words earthlings bid adieu to their handiwork. Within seconds the product of years of dedicated effort by AMSAT teams around the world would leap into the sky and forever out of sight.

But for an instant transfixed, it seemed, we watched knowing, hoping, we would see our progeny to its next and final port-of-call. And then it was all fire and fury; smoke, flame and roar, as away it flew. Perched atop the Ariane-4 launcher as it roared into the azure skies above Kourou, French Guiana, AMSAT OSCAR 13 bid farewell to us and to CSG Kourou, its recent tropical home.

Now with AO-13 safely ensconced in its final orbit and telling us all of its experience there, we can reflect a moment on what this tropical home, Kourou, had been like for the AMSAT teams which briefly had lived and worked in this equatorial land.

Expecting tales of hardship in the steamy jungle setting, one is surprised to find life at the CSG (French for Guiana Space Center) Kourou quite civilized; even urbane. French Guiana lies on the northeast coast of South America, just north of the equator. It's bounded by Surinam to the west and Brazil to the south and east. Having an area of nearly 35,000 square miles and a population of approximately 75,000, it's maintained as a French overseas department, or administrative district. Its status is very similar to a department in metropolitan France and is represented in the French Parliament by a senator and a deputy. The climate is characterized by high temperatures with monthly averages at Cayenne, the capital, varying between 77 and 80 degrees and rainfall averaging 150 inches per year.

Situated 30 miles northwest of Cayenne, the modern town of Kourou was established in 1968 in conjunction with the development of the European Space Agency's launch facility there. Until then, the territory had undergone few changes since the notorious penal colony days (Devil's Island) that began in 1852 and persisted for nearly nine decades, sinking the country into disrepute. But with space-age technology came modern amenities.

Two of the AMSAT-NA team members, Jeff Zerr and Jim Boschert, recently spoke of their experiences at CSG Kourou. While both Jeff and Jim were involved with various aspects of the final stages of integration, they spent much time with photographic and video responsibilities. One of Jim's photos graced the cover of June 1988 *QST*.

Arriving at night at Rochambeau International Airport, visiting teams rent a Renault for the hour drive to Kourou. Airline connections having been made in Martinique, visitors soon arrive at the Hotel Le Roche on the banks of the River Kourou. While an unlikely Michelin Guide four-star candidate, the hotel afforded quite adequate accommodations including TV and refrigerator in each room and effective air conditioning. All rooms overlooked the Kourou River, a fact that may account for its reputation as the "premier hotel" of Kourou. Then again, that may be like being the best McDonald's in Beijing. Not much competition.

The French are legend for their gastronomical predilections. Evidence abounds in Kourou. Jeff says restaurants were "mostly Chinese or Vietnamese and excellent without exception." Team members dined out most every evening. Other meals were prepared in the hotel after shopping at the local grocery store. The supermarket was certainly no carry over from colonial days, what with its laser scanners and gourmet delights imported from France. In fact, Jim pointed out, it was rather strange to "hear loud native music blaring throughout this modern facility as if it were a disco."

We were curious what the folks did in their spare time. We learned diversions are many in this tropical land. The hotel offers a substantial pool for its guests and the beaches,

despite their intimidating surf, are inviting. European style bathing attire, more or less, made passing idle time at the beach a rewarding diversion.

The Space Agency offers the use of Renault-4's to its guests. Jeff described them as "60 mile per hour go-karts, each with it's own personality — some good; some bad."

For long journeys, rental cars were available. Such was the case on a trip to Saint-Laurent-du-Maroni to view the turtle egg-laying. Jim described his dismay as tourists attempted to photograph the ritual that has continued since prehistory.

On the return to Kourou, Jeff ran over a snake that was stretched across the entire highway like a huge fire hose; the anaconda (?) covered both lanes! He was reminded of a story from a previous campaign. Werner Haas, visiting when more spartan accommodations were the norm, responded to nature's call one night only to find a deadly poisonous snake in the open air toilet! Indeed, this would have caused many to pack for home. (No word on the snake's reaction!)

Being away from family and friends seems naturally to promote the purchase of gifts to bring home. Jeff recounted a rather "interesting " story involving another AMSAT-NA team member, Brent Helleckson. It seems Brent wanted to purchase lingerie for his wife in a local shop operated by an attractive French woman. After some language difficulties aggravated by the required conversion of European sizes to American ones, both finally reverted to sign language to effect the transaction. But of course, this was strictly business, there was work to be done and everyone rose admirably to the task, chuckles and guffaws notwithstanding.

"Every morning, the ESA project interface guy would come into the clean room and shake our hands," Jim said, "making everyone know he was important." This was reiterated by Jeff as well and apparently made for excellent relations between the ESA and AMSAT teams. The work attitude was one of "slow down and do it right." Indeed, it must work as we now have a satellite that was obviously "done right!"

Everything was low key, right down to the paint schemes of the various buildings that make up the complex. Jim commented that he was "amazed at how clean everything was in Kourou, with beautiful scenery and no insects." He even found the air conditioning less desirable than the natural environment. Both Jeff and Jim found their stay to be most enjoyable. Jim exclaimed: "It was the most therapeutic thing I have ever done!"

Enjoyable and relaxing it may have been. And we all are grateful for what ever beneficent effects it may have had in helping the AMSAT teams there perform their duties flawlessly. Today, with AO-13 flying high, we bear witness to the fruits of their short, profitable stay at CSG Kourou.

And while the short-term human tenants may desire to return, and may even realize that dream one day, another short-term tenant seems entirely content to ply the ether far, far above.

Short Bursts

• Nominations for AMSAT-NA Director closed June 30. Those nominated included: Tom Clark, W3IWI; John Henry, VE2VQ; Phil Karn, KA9Q; Doug Loughmiller, KO5I; Andy MacAllister, WA5ZIB; Vern Riportella, WA2LQQ. Election materials will be sent out next month to all current members. There are four seats up for election this year.

• AMSAT has issued a Call For Papers for its Annual Space Symposium. Papers on topics relevant to the Amateur Space Program are solicited. Deadline for submission is September 10, 1988. The Symposium will be held in Atlanta this year on November 9. This is a preliminary announcement only. Details to follow ASAP. Mail abstracts and/or papers to AMSAT, P.O. Box 27, Washington DC, 20044

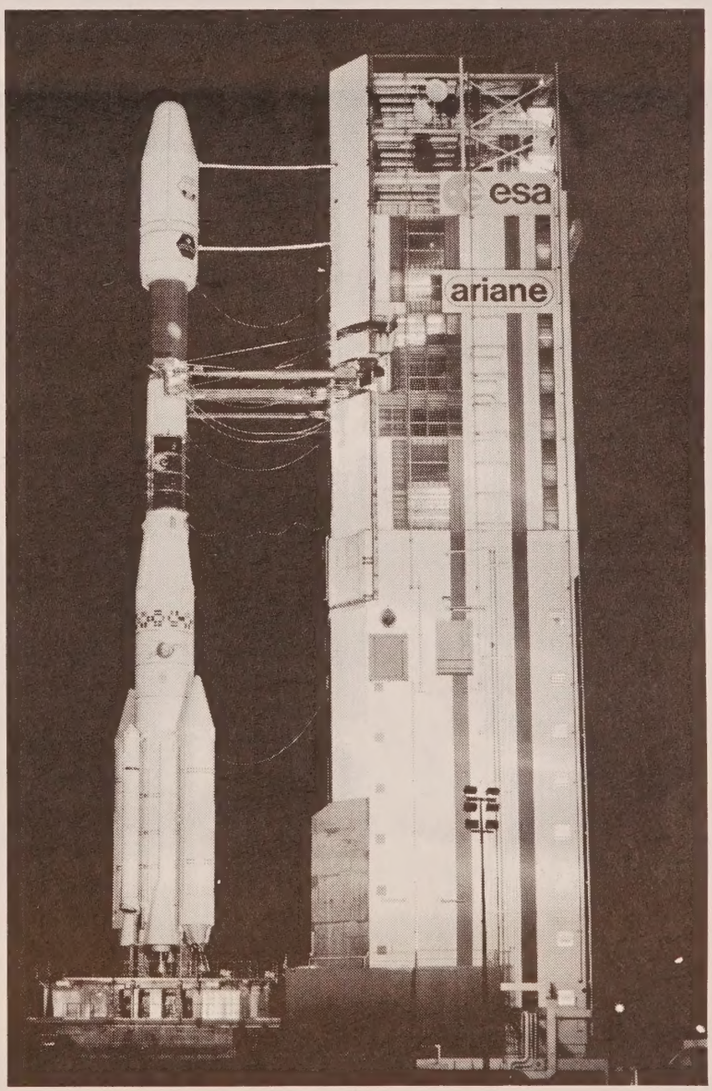
• The Space Shuttle Discovery was rolled out to the launch pad early July 4. Best estimates now place its launch in early September.

• Handsome posters of AMSAT OSCAR 13 in orbit are now available from AMSAT HQ. Call or write to obtain yours.

• Here is the current AO-10 operating schedule:

Through July 31:	Mode B MA 25 to MA 235
August 1 - August 15:	Mode B MA 30 to MA 240

The satellite will be unavailable for use beginning August 16 because of predicted insufficient solar illumination and reduced battery charge. If "FMing" of signals occur sooner than August 15, DO NOT USE AO-10 please. As always, please use minimum power required for communications. Listen to your nets for later updates, or to AMSAT OSCAR 13 beacons beginning in late July for any changes to this schedule.



CSG Kourou, shortly before launch of AO-13.

- Here is the FO-12 operating schedule.

Mode	From	(UTC)	Mode	From	(UTC)
JD	20	1356	D	12	0724
DI	21	1301	JA	13	0630
JD	23	1141	D	14	0536
DI	24	1020	JD	18	0603
JD	26	1033	DI	19	0712
DI	27	1141	JD	20	0415
JD	30	1100	DI	21	0523
DI	Jul 31	1006	JD	25	0348
JA	Aug 02	1020	DI	26	0457
D	03	1128	JD	27	0606
JA	06	0845	D	28	0511
D	07	0751	JA	30	0120
JA	11	0617	D	Aug 31	0228

JD = Digital mode
JA = Analog mode
D = All systems off
DI = Systems off except CPU and memory

The transponders will be off at other times. The actual operating schedule may change due to unexpected situations such as variations in available power.

Fixes Found For Software Glitches

A flurry of recent activity has occurred in connection with the N4HY QUIKTRAK and SUPERTRAK programs. Here is a synopsis of what's been found to date.

In GNDTRACK, in line 650, it ends MC=MC+1: GOTO 670. Remove the part that says : GOTO 670.

A fix for the "Passes cannot occur" problem found when AO-13 had a higher eccentricity can be made by people who are running this program using uncompiled BASIC.

In the latest version of Quiktrak.bas, lines 2780, 2790 and 2800 read:

```
2780 IF FNC(R0*(1#+E(I%)*COS(D1-W*P0))/A/E2)+J>ABS(L9(IQ%)*P0)
     THEN RETURN
2790 PRINT "PASSES CANNOT OCCUR ";K$
2800 GU%=0:FOR KD%=1 TO 6000:NEXT:RETURN
```

Replace ALL of these lines with: 2780 RETURN. Delete lines 2790 and 2800 in their entirety.

Meanwhile, some minor bugs have shown up in Quiktrak 3.2 for the IBM PC and C-64. These will be corrected and combined with several enhancements in the new 3.3 level soon.

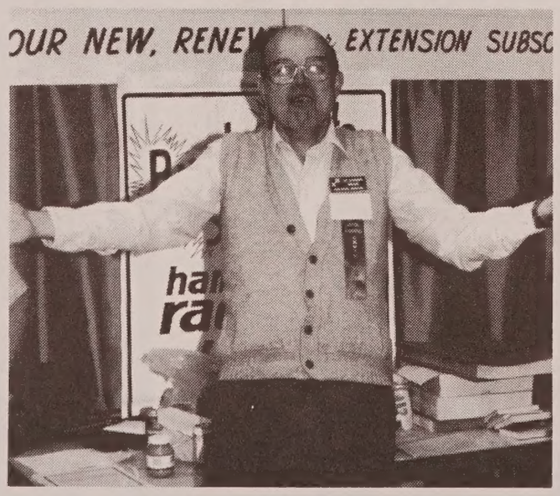
New features are:

(1) ansi.sys is no longer needed
(2) You will be able to have many more satellites in the kep file
(3) Editing times, etc will be more user friendly.
(4) You may autotrak from the many satellite tabular mode by using the cursor to select.
(5) bug fixes in search and equator crossing/apogee

AMSAT® NA

The Radio Amateur Satellite Corporation

Post Office Box 27
Washington, DC 20044
(301) 589-6062



Dayton '88: Joe Schroeder, W9JUV, in the HR booth expresses greetings for camera.

Non-Profit Organization Second Class POSTAGE PAID at Waterbury, Conn.

LM-1096 KA6M 99.81
MAGNUSKI, HANK
2019 BARBARA DR.
PALO ALTO CA 94303

Amateur Satellite Report (ISSN 0889-6089) is published biweekly for $16 (inseparable from annual membership dues of $24) by AMSAT, Post Office Box 27, Washington, DC 20044. Second class postage paid at Silver Spring, MD and additional mailing offices. POSTMASTER: send address changes to *Amateur Satellite Report*, Post Office Box 27, Washington, DC 20044.